AMENDMENTS TO THE CLAIMS

1 to 33. (canceled).

34. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about volume; and

selecting a therapy based on said information.

C1

35. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

36. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

37. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

38. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

39. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

40. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

41. (previously presented): The method of claim 34, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,

(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,

(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),

(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and

(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

C1

42. (previously presented): The method of claim 34, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

43. (previously presented): The method of claim 34, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

44. (previously presented): The method of claim 34, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

45. (previously presented): The method of claim 34, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

46. (previously presented): The method of claim 34, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

47. (previously presented): The method of claim 46, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

48. (previously presented): The method of claim 47, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

C1

49. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about area; and

selecting a therapy based on said information.

50. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

51. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

52. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

C1

53. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

54. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

55. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

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56. (previously presented): The method of claim 49, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,
(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,
(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),
(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and
(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

57. (previously presented): The method of claim 49, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

58. (previously presented): The method of claim 49, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

59. (previously presented): The method of claim 49, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

60. (previously presented): The method of claim 49, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

61. (previously presented): The method of claim 49, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

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62. (previously presented): The method of claim 61, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

63. (previously presented): The method of claim 62, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

64. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about thickness; and

selecting a therapy based on said information.

65. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

66. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and transmitting the degeneration pattern to a site for analysis.

67. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

68. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

69. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

70. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

71. (previously presented): The method of claim 64, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,

(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,

(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),

(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and

(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

72. (previously presented): The method of claim 64, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

73. (previously presented): The method of claim 64, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

74. (previously presented): The method of claim 64, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

75. (previously presented): The method of claim 64, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

76. (previously presented): The method of claim 64, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

77. (previously presented): The method of claim 76, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

78. (previously presented): The method of claim 77, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

79. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about curvature; and selecting a therapy based on said information.

80. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

81. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

82. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

83. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

84. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

85. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

86. (previously presented): The method of claim 79, wherein said electronically evaluating further comprises:
correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,
(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,
(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),
(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and
(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

87. (previously presented): The method of claim 79, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

88. (previously presented): The method of claim 79, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

89. (previously presented): The method of claim 79, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

90. (previously presented): The method of claim 79, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue

implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

91. (previously presented): The method of claim 79, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

92. (previously presented): The method of claim 91, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

93. (previously presented): The method of claim 92, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

94. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about geometry; and

selecting a therapy based on said information.

95. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

96. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

97. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

98. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

99. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

100. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

101. (previously presented): The method of claim 94, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,

(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,

(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),

(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and
(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

102. (previously presented): The method of claim 94, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

103. (previously presented): The method of claim 94, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

104. (previously presented): The method of claim 94, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

105. (previously presented): The method of claim 94, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

106. (previously presented): The method of claim 94, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

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107. (previously presented): The method of claim 106, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

108. (previously presented): The method of claim 107, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

109. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about water content; and

selecting a therapy based on said information.

110. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

111. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

112. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

113. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

114. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

115. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

116. (previously presented): The method of claim 109, wherein said electronically evaluating further comprises:
correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,
(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,
(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),
(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and
(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

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117. (previously presented): The method of claim 109, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

118. (previously presented): The method of claim 109, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

119. (previously presented): The method of claim 109, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

120. (previously presented): The method of claim 109, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

121. (previously presented): The method of claim 109, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

121. (previously presented): The method of claim 121, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

123. (previously presented): The method of claim 122, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

124. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about sodium content; and

selecting a therapy based on said information.

125. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

126. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

127. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

128. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

129. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

130. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

131. (previously presented): The method of claim 124, wherein said electronically evaluating further comprises:
correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,
(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,
(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),
(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and
(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

132. (previously presented): The method of claim 124, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

133. (previously presented): The method of claim 124, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

134. (previously presented): The method of claim 124, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

135. (previously presented): The method of claim 124, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

136. (previously presented): The method of claim 124, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

137. (previously presented): The method of claim 136, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

138. (previously presented): The method of claim 137, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

139. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about hyaluronic acid content; and

selecting a therapy based on said information.

140. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

141. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

142. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

143. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

144. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

145. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

146. (previously presented): The method of claim 139, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,

(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,

(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),

(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and

(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

147. (previously presented): The method of claim 139, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

148. (previously presented): The method of claim 139, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

149. (previously presented): The method of claim 139, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

150. (previously presented): The method of claim 139, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

151. (previously presented): The method of claim 139, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

152. (previously presented): The method of claim 139, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

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153. (previously presented): The method of claim 152, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

154. (previously presented): A method of treating a human joint disease involving cartilage comprising:

obtaining an electronic image of a joint, wherein said image includes both normal and diseased cartilage tissue;

electronically evaluating said image to obtain information about signal intensity or relaxation time of said normal or diseased tissue; and

selecting a therapy based on said information.

155. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

estimating the loss of cartilage in a joint, wherein the joint comprises cartilage and accompanying bones on either side of the joint, which method comprises,

obtaining a three-dimensional map of the cartilage at an initial time and calculating the thickness or regional volume of a region of degenerated cartilage mapped at the initial time,

obtaining a three-dimensional map of the cartilage at a later time,

calculating the thickness or regional volume of a region of degenerated cartilage mapped at the later time, and

determining the loss in thickness or regional volume of the region of degenerated cartilage between the later and initial times.

156. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

assessing the condition of cartilage in a joint of a human, which method comprises,

electronically transferring an electronically generated image of a cartilage of the joint from a transferring device to a receiving device located distant from the transferring device,

receiving the transferred image at the distant location,

converting the transferred image to a degeneration pattern of the cartilage, and

transmitting the degeneration pattern to a site for analysis.

157. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

determining the volume of cartilage loss in a region of a cartilage defect of a cartilage in a joint of a mammal which method comprises,

determining the thickness, D_N, of the normal cartilage near the cartilage defect,

obtaining the thickness of the cartilage defect, D_D, of the region,

subtracting D_D from D_N to give the thickness of the cartilage loss, D_L, and

multiplying the D_L value times the area of the cartilage defect, A_D, to give the volume of cartilage loss.

158. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

estimating the change of cartilage in a joint of a mammal over time, which method comprises,

estimating the thickness or width or area or volume of a region of cartilage at an initial time T_1,

estimating the thickness or width or area or volume of the region of cartilage at a later time T_2, and

determining the change in the thickness or width or area or volume of the region of cartilage between the initial and the later times.

159. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

providing a biochemically based map of joint cartilage of a mammal, wherein the joint comprises cartilage and associated bones on either side of the joint, which method comprises,

measuring a detectable biochemical component throughout the cartilage,

determining the relative amounts of the biochemical component throughout the cartilage,

mapping the amounts of the biochemical component in three dimensions through the cartilage, and

determining the areas of abnormally joint cartilage by identifying the areas having altered amounts of the biochemical component present.

160. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

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estimating the change of cartilage in a joint, wherein the joint comprises articular cartilage, which method comprises,

defining a 3D object coordinate system of the joint at an initial time, T_1,

identifying a region of a cartilage defect within the 3D object coordinate system,

defining a volume of interest around the region of the cartilage defect whereby the volume of interest is larger than the region of cartilage defect, but does not encompass the entire articular cartilage,

defining the 3D object coordinate system of the joint at a second timepoint, T_2,

placing the identically-sized volume of interest into the 3D object coordinate system at timepoint T_2 using the object coordinates of the volume of interest at timepoint T_1, and

measuring any differences in cartilage volume within the volume of interest between timepoints T_1 and T_2.

161. (previously presented): The method of claim 154, wherein said electronically evaluating further comprises:

correlating cartilage image data, bone image data, and optoelectrical image data for the assessment of the condition of a joint, which method comprises,

(a) obtaining the cartilage image data of the joint with a set of skin reference markers placed externally near the joint,

(b) obtaining the bone image data of the joint with a set of skin reference markers positioned in the same manner as the markers in (a),

(c) obtaining the optoelectrical image data of the joint with a set of skin reference markers positioned in the same manner as (a) and (b), and

(d) using the skin reference markers to correlate the images obtained in (a), (b) and (c) with each other, wherein each skin reference marker is detectable in the cartilage and bone data and the opto-electrical data.

162. (previously presented): The method of claim 154, wherein said electronic image provides information on the thickness, shape, or curvature of said normal and said disease tissue or the location and size of said diseased tissue.

163. (previously presented): The method of claim 154, wherein said therapy comprises autologous chondrocyte transplantation, osteochondral allografting, osteochondral autografting, tibial corticotomy, femoral or tibial osteotomy.

164. (previously presented): The method of claim 154, wherein said therapy uses cartilage or bone tissue grown ex vivo, stem cells, an artificial non-human material, an agent that

stimulates repair of said diseased tissue, or an agent that protects said diseased tissue and that protects adjacent normal tissue.

165. (previously presented): The method of claim 154, wherein said information is used to determine the thickness or other geometrical feature of a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold, or a tissue regenerating material or tissue repair system.

166. (previously presented): The method of claim 154, wherein said image is obtained using ultrasound, computed tomography, positron emission tomography, a single photon emission computed tomography scan, or MRI.

167. (previously presented): The method of claim 166, wherein said information is used to generate a three-dimensional map of cartilage thickness or a physical model of said normal or said diseased tissue or both.

168. (previously presented): The method of claim 167, wherein said physical model is used to shape a tissue transplant, a tissue graft, a tissue implant, a tissue replacement material, a tissue scaffold or a tissue regenerating material or tissue repair system.

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